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Brooding Space and Phase Feeding Strategies for White Pheasants

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Abstract: Two experiments were conducted during a growout of male and female white pheasants to evaluate brooding space needed the first 6 wk and appropriate phase feeding strategies in the growing-finishing stages of growth. One-day-old chicks were placed into brooder pens with stocking rates of 150, 200 or 250 chicks/pen. Individual body weight and feed conversions for each pen were measured at 3 and 6 wk of age and litter moisture was measured at 3 wk. Birds were separated by gender at 6 wk and fed a common grower diet to 12 wk of age. At 12 wk, approximately half of the birds of each gender were fed either the grower diet or a finisher diet containing about 5 percentage units less crude protein than the grower diet. Body weight and feed conversion were measured on a pen basis at 12 wk for all birds, 17 wk for cockerels and 20 wk for hens. At market age, a sample of birds from each pen was selected to measure carcass yield and proximate analysis. There were no effects on body weight, coefficient of variation of body weight within pen, or feed conversion in the brooding period. High stocking density (250 chicks/pen) increased litter moisture at 3 wk. There were no dietary treatment effects on growth performance or carcass traits for either gender in the growing-finishing phases. The results showed that dietary protein could be reduced by 23% in a finisher diet fed after 12 wk of age to white pheasants.

Key words: Brooding space, phase feeding, protein, white pheasant

Introduction

White pheasant production is used for meat production to avoid darker pigmented spots on the meat that can be observed with pheasants that have darker plumage. Through crossbreeding, this meatier type pheasant has been developed to provide a larger bird with higher breast yield than the ringneck pheasant. Although white pheasant production is not new, there has been little research reported with this type of bird. White pheasant chicks are commonly brooded at 4 birds per square foot to 6 wk of age. However, it is not known if the chicks could grow just as well with less space or if extra space would improve white pheasant production. There are no published animal care guidelines for raising white pheasants.

Feeding suggestions for pheasants are available (Leeson and Summers, 1991; Flegal, 1994). These published feeding guidelines are targeted to pheasants grown for later release or breeding purposes and state that a starter diet should be fed the first 6 wk followed by a grower diet the next 6 wk. Other programs suggest feeding the starter diet for 4 wk before changing to a grower diet (NRC, 1994; Leeson and Summers, 2005). An additional diet is then suggested before feeding a breeder diet which may be called the maintenance or holding diet (Flegal, 1994; Leeson and Summers, 2005). However, Leeson and Summers (1991) referred to this diet as a "grower 2" diet and suggested that it should be fed to pheasants produced for meat production from 12 wk of age to market. Regardless of the name of the diet, this diet is characterized primarily by lower protein and energy and higher fiber. White pheasants grown commercially in the U.S. are often fed the grower diet to market age, but some producers may feed a "grower 2" or "finisher" diet.

Nutrient requirements for ring-necked pheasants are provided by NRC (1994). However, there is no documentation for much of the recommendations offered. Although research results are available for calcium and available phosphorus requirements (Reynnells, 1979), less is known about the protein (amino acid) needs of pheasants and how diet phases should be allocated to optimize growth, carcass composition, feed conversion and feed cost. The inclusion of a finisher diet in white pheasant meat production may allow for improvements in profitability and also result in less nitrogen excretion from the birds. The objectives of this study were to evaluate optimum brooding space for white pheasant chicks and to determine if a finishing diet fed after 12 wk of age would provide production results similar or better than a feeding system in which a grower diet is fed to market age.

Materials and Methods

A total of 2400 chicks were transported from a commercial hatchery[1] and placed at day of age at the Michigan State University Poultry Teaching and Research Center into 10' X 5' pens containing brooder lamps in a room heated to 28.3°C. The pens were

Table 1: Composition of the grower and finisher diets

Ingredient	Grower %	Finisher %
Corn	55.38	60.89
Soybean meal, dehulled	30.20	14.00
Wheat middlings	3.00	11.00
Meat and bone meal	2.50	2.50
Feather meal	0.84	1.20
Malt sprouts	0.00	5.00
Choice White Grease	2.57	1.56
Blood meal	0.45	0.04
Dicalcium phosphate	2.68	1.80
Limestone	1.47	1.20
DL-methionine	0.19	0.13
L-lysine-HCl	0.16	0.12
Salt	0.36	0.39
Vitamin Premix[1]	0.12	0.12
Trace Mineral Premix[2]	0.05	0.05
Choline Cl, 60%	0.03	0.00
Calculated nutrient composition		
Crude protein, %	22.00	17.00
ME, Kcal/kg	2900	2855
Lysine, %	1.32	0.90
Methionine + Cystine, %	0.88	0.67
Analyzed nutrient composition		
Crude protein, %	23.23	17.72

[1]Vitamin premix provided per kg diet: vitamin A (all-trans-retinyl acetate), 11,000 IU; cholecalciferol, 5,000 ICU; vitamin E (all-rac-α-tocopherol acetate), 35 IU; menadione (as menadione sodium bisultite), 2.75 mg; riboflavin, 10 mg; Ca pantothenate, 20 mg; nicotinic acid, 80 mg; vitamin B_{12}, 0.025 mg; vitamin B_6, 4.3 mg; thiamin (as thiamin mononitrate), 2.9 mg; folic acid, 2.2 mg; biotin, 0.2 mg; vitamin C, 0.10 g; selenium, 0.275 mg; and ethoxyquin, 125 mg.
[2]Mineral premix supplied per kg of diet: manganese, 100 mg; zinc, 100 mg; iron, 50 mg; copper, 10 mg; iodine, 1 mg.

constructed by placing gates in 10' X 15' pens to reduce the size of the pens to accommodate adequate replication of the desired brooder space treatments. Cardboard was used to cover holes in the gates to prevent birds from leaving the pen area. Brood treatments consisted of a pen of 250, 200 or 150 chicks in each of 4 pens per treatment. These populations resulted in 190, 237 or 316 cm^2 per bird. Adjustments were made with extra feeders to equalize feeder space between treatments. Feed and water were provided *ad libitum*. All birds were fed a common crumbled starter diet from a commercial source[2] to 6 wk of age. The starter diet was formulated to contain 28% crude protein. Body weight, feed conversion and livability were measured for the starting phase at 3 and 6 wk of age.

Basic management was provided as directed by management from the chick supplier. Room temperature was set at 32.2°C when the chicks were placed. Infrared heat lamps were also provided the first week as a supplemental heat source. The lamps were removed after 1 wk and room temperature was reduced by 1.8°C each wk to 2 wk of age. Temperature was reduced by about 2.5°C each wk afterwards until it reached 18.3°C at 40 days of age. A set of 4 pens in each ventilation zone was equipped with a ventilation fan that was set to run for 30 sec/10 min the first 10 days and was increased to 1 min/10 min afterwards. Light was provided via white incandescent bulbs the first 4 wk of the experiment and the chicks were given 24 hr the first wk. A dark period was introduced the second wk and was increased by 1 hr each day until a 16L:8D schedule was reached. Light intensity was decreased at 11 days of age to less than 10 lux for all pens. After the birds were weighed at 3 wk of age, the lighting schedule was changed to 8L:16D. An intermittent light schedule was used in which 1 hr of lighting was followed by 2 hr of darkness. At 4 wk of age, the white bulbs were replaced with green incandescent bulbs to reduce flightiness and pecking. Pecking activity was observed at 2 and 5 wk of age. Birds in each pen were observed for a 10 min period. Number of pecks and object pecked was recorded.

The birds were sex separated, fitted with spectacles to prevent cannibalism, and spread out to 28 pens (3.08 m X 4.62 m) at 6 wk of age with approximately 75 birds per pen to yield about 0.19 m^2 per bird which has been proven to be adequate in grow-out. Approximately half the birds were fed a grower diet (22 % crude protein) to 17 or 20 wk of age for males or females, respectively, per industry standard. The other half were fed the grower diet to 12 wk of age and a finisher diet (17 % crude protein) to market age. The grower diet was manufactured as a mini-pellet and the finisher diet was fed as pellets and ingredient compositions are listed in Table 1. Both diets were obtained from the same commercial source as the starter diet. Feed samples for each diet were ground and nitrogen content was measured[3] to calculate crude protein content. Body weight and feed intake were measured at 12 wk and at 17 or 20 wk of age for feed conversion calculation for cockerels or hens, respectively. Mortality was monitored daily. Seven cockerels or 6 hens per pen were randomly be selected at 17 or 20 wk of age, respectively, based upon perceived average body weight and slaughtered at the MSU Meat Laboratory. Hot carcass yield (without giblets) was determined for each bird and two carcasses per pen were used for carcass composition analysis. Two eviscerated carcasses per pen were ground whole, pooled and mixed together within pen to measure carcass moisture, protein (nitrogen), fat (ether extract) and ash analyses[4].

Results and Discussion

There were no differences in body weight, coefficient of variation of body weight, feed conversion (net) or feed conversion adjusted for mortality (Table 2). Mortality was

Table 2: Effect of brooding space on growth performance of white pheasants[1]

Parameter	Chicks/pen				
	150	200	250	SEM	P<
21 days of age					
Body weight (g)	159	160	158	3	0.947
CV (%)	13.4	13.6	13.4	0.3	0.788
Feed:gain (net)	2.16	2.02	2.08	0.04	0.147
Feed:gain (adjusted)	2.14	1.98	2.05	0.04	0.118
Mortality (%)	6.5	8.2	5.9	1.4	0.522
Litter moisture (%)	17.6[b]	21.0[b]	31.3[a]	3.1	0.032
42 days of age					
Body weight (g)	521	517	510	6	0.497
CV (%)	13.9	13.8	14.2	0.4	0.731
Feed:gain (net)	2.59	2.50	2.41	0.05	0.114
Feed:gain (adjusted)	2.54	2.48	2.39	0.06	0.300
Mortality (%)	6.5	8.7	6.3	1.4	0.435

[a-b] Means in a column with no common superscripts differ significantly (P< 0.05). [1]Means represent 4 pens per treatment.

Table 3: Effect of feeding regimen on growth performance and carcass characteristics of male white pheasants

Parameter	Grower	Grower/Finisher	SEM	P<
17-wk Body weight (g)[1]	1,561	1,565	16	0.904
6-20 wk Feed:gain (net)[1]	5.44	5.55	0.16	0.649
6-20 wk Feed:gain (adjusted)[1]	5.31	5.40	0.16	0.693
Carcass				
yield (%)[2]	69.54	69.51	0.37	0.951
protein (%)[3]	21.94	22.29	0.26	0.511
fat (%)[3]	8.64	7.52	0.90	0.546
moisture (%)[3]	65.81	66.61	0.68	0.571
ash (%)[3]	3.94	4.08	0.08	0.571

[1]Means represent 13 pens per treatment and about 80 birds per pen.
[2]Means represent 13 pens per treatment and 7 birds per pen. Giblets are not included.
[3]Means represent 13 pens per treatment and 2 carcasses per pen.

Table 4: Effect of feeding regimen on growth performance and carcass characteristics of female white pheasants

Parameter	Grower	Grower/Finisher	SEM	P<
20-wk Body weight (g)[1]	1,485	1,456	11	0.225
6-20 wk Feed:gain (net)[1]	5.70	5.76	0.06	0.596
6-20 wk Feed:gain (adjusted)[1]	5.60	5.66	0.04	0.477
Carcass				
yield (%)[2]	67.47	67.09	0.27	0.486
protein (%)[3]	19.29	19.53	0.24	0.466
fat (%)[3]	18.73	19.74	0.96	0.608
moisture (%)[3]	58.47	57.75	0.72	0.627
ash (%)[3]	3.33	3.10	0.07	0.128

[1]Means represent 15 pens per treatment and about 80 birds per pen.
[2]Means represent 15 pens per treatment and 6 birds per pen. Giblets are not included.
[3]Means represent 15 pens per treatment and 2 carcasses per pen.

similar for all treatments and averaged 7%. Typical mortality during the brooder period is about 6% (T. Baumeister, MacFarlane Pheasants, Inc., personal communication). The birds appeared to have some difficulty consuming the crumbles during the first wk. It is recommended that starter feed be ground up for feeding the first 5-7 days to pheasant chicks.

The lack of effect on growth (average and variability) provides indication that there was no negative effect on bird well-being due to brooding space. Body weight at 6 wk was about 40% higher than the expected body weight of ring-necked pheasant chicks at the same age (Leeson and Summers, 2005). However, at the highest bird density level, litter moisture was significantly

increased to above 30%. In meat bird production, a litter moisture content of 25% is typically considered as an upper limit to avoid litter management problems. Caking of the litter at the highest bird density was prevalent during the third week of production. Litter pecking was the primary activity in the brooding and there were very few incidences of birds pecking one another.

Cockerels were heavier and more efficient at converting feed to gain during the grower phase compared to hens (1,411 vs. 1.089 g and 3.13 vs. 3.31 g:g, respectively; data not shown). These body weights are about 33% higher than expected body weights of male or female ring-necked pheasants (Leeson and Summers, 2005). Mortality was about 1% during the 6 to 12 wk growing period. Birds were flighty during this phase and very sensitive to new light sources such as beams from flashlights, but there were no problems with cannibalism. Fighting between birds was observed more in the finisher phase, especially the last 2 wk the cockerels were housed. Scratching on the backs of cockerels was observed widely during slaughter and resulted in more B grade carcasses for birds taken to a commercial processing facility. The chicks were delivered with toenails intact. Although this is policy for pheasants grown in outdoor flight pens, toenail trimming should be commonly practiced for white pheasants grown indoors especially for cockerels. There is some reluctance in the pheasant industry to feed lower protein due to concerns that the increase in calorie:protein ratio of a finisher diet compared to a grower diet will cause an increase in hysteria. However, there was no indication of an increase in activity or "flightiness" in this study when the finisher diet was fed.

There were no diet effects on growth performance or carcass yield of male (Table 3) or female (Table 4) white pheasants. Feed conversion was poor during the finishing phase, especially for cockerels as little weight was gained during this phase by the male pheasants. The female white pheasants continued to weigh much more than a female ring-necked pheasant at market age, but male white pheasants were only about 5% heavier than a male ring-necked pheasant at a comparable age (Leeson and Summers, 2005).

Although there were no dietary effects on carcass characteristics, a difference was observed in carcass fat during processing. Hen carcasses were greasy and had noticeably more abdominal fat. Carcass fat analysis shows that the hen carcasses contained more than twice the fat content of cockerel carcasses.

Based upon this information, there appears to be potential to reduce feed costs and nitrogen excretion/emissions by feeding a finisher diet with reduced crude protein. Feed cost was $3.00-3.45/ton higher for grower feed compared to finisher feed in this study. The finisher diet supplied about 23% less nitrogen than the grower diet. The results of this study show that white pheasant chicks are being raised at an appropriate space allocation for bird well-being and litter management and that feeding a finisher diet provides an opportunity for increased profitability for white pheasant production.

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[1]MacFarlane Pheasants, Inc., Janesville, WI

[2]NutrenaTM, Cargill Animal Nutrition, Marshall, MI

[3]Leco Nitrogen Analyzer, Leco Corp., St. Joseph, MI

[4]Experiment Station Chemical Labs, University of Missouri, Colombia, MO

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